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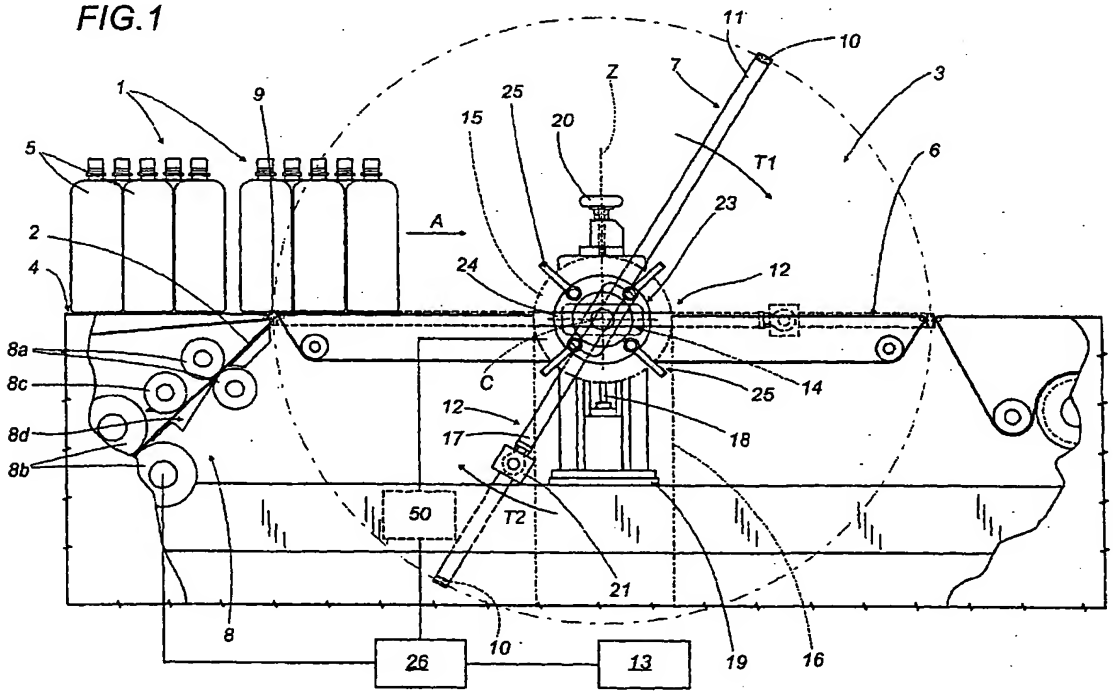
(54) An apparatus for wrapping groups of products with plastic film

(57) An apparatus for wrapping groups (1) of products with film (2) comprises a first conveyor surface (4) which carries product (5) to a second surface (6) for group (1) forming and group (1) wrapping, using means (7), with a portion of film (2), the apparatus comprising, in combination, a film (2) feed unit (8); means (7) for wrapping the group (1) of products consisting of at least one crosspiece (10) which supports and guides the portion of film (2), and adjusting means (12) acting at least on the single bar (11) and designed to allow rotation of the crosspiece (10) between a first, active trajectory (T1) extending over the second surface (6), and a second, return trajectory (T2) extending under the second surface (6).

FIG.1



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Description

[0001] The present invention relates to an apparatus for wrapping groups of products with a plastic film, in particular heat-shrink plastic.

[0002] The apparatus is fitted on product conditioning machines, in particular for processing products which have a cylindrical - prismatic shape, such as bottles, cans or similar items.

[0003] At present, automatic machines of the above-mentioned type have a bottle processing and feed line (the specific term bottle being used to simplify this description, but without excluding products which have other shapes) with successive intermediate product positioning and forming stations and with stations for wrapping or packaging the groups of products in plasticised wrappers.

[0004] The intermediate positioning and forming stations are designed to form groups consisting of a preset number of products, which may vary according to the dimensions and the pack made (in the case of bottles, for example, each group may consist of two rows of three bottles arranged one after another) and transport the products to the wrapping stations, after which the finished group of products leaves the station and passes, on a conveyor line, to a final station which packages the products, normally using heat-shrink film.

[0005] This wrapping - packaging station has a feed system for a reel of plastic, heat-shrink film (used to make the wrappers), which is fed continuously from a station located below the product conveyor surface.

[0006] The reel feeds a unit which defines and cuts the film into portions with the length required to wrap the group of products in the direction of product feed, as far as the product conveyor.

[0007] On the surface there is a special wrapping "bridge" which guides the film over the groups (by means of crosspieces which support the suspended film, moved by chains parallel with and on both sides of the crosspieces), passing through a slot and allowing wrapping during feed.

[0008] In practice, the group of products is wrapped with the film which unwinds in the direction of product feed. The ends of the film are partially overlapping at the end of the wrapping movement and the vertical side faces of the products in the group are left uncovered. Compacting of the film on the product is achieved by the heat-shrinking typical of the film, as is well known in this sector.

[0009] Currently, based on this machine structure, attempts have been made to improve productivity and to reduce down times, for example, size changeovers for products to be packaged, requiring various operations on the drive units (such as those of the unit which feeds and cuts the film, so as to change the length of the portions of film), and mechanical down times, for example, due to adjustments with manual means in the height of the structure which drives the film lifting and guide crosspieces.

[0010] For this reason, the Applicant designed and built a feed and cutting unit (see patent EP 839.723) located immediately below the slot for film feed to the wrapping surface and consisting of a pair of counter-rotating rollers between which the film to be fed is inserted, at a tangential point of contact. The first roller has a radially projecting blade, whilst the second roller has a radial groove housing the blade during a cutting rotation, and a flat facet on its surface, forming a channel for the free transit of the film.

[0011] This structure significantly improves film feed and cutting, almost continuously, and with a rapid size changeover in terms of the length and formation of the portion of film to be used on the groups of products.

[0012] However, notable disadvantages remain relative to size changeover of the wrapping unit, which requires work on both the bridge structure (using handwheels), and on both zones at the sides of the structure, adjusting either the number or the position of the film lifting and guide crosspieces. The aim of the present invention is, therefore, to overcome the above-mentioned disadvantages by providing an apparatus for wrapping groups of products with plastic film which can speed up and synchronise film feed and cutting operations and rationalise size changeover operations on the unit which wraps the groups of products, with a simple, precision, compact structure.

[0013] Accordingly, the present invention provides an apparatus for wrapping groups of products with film, comprising a first conveyor surface which carries products to a second surface for forming said groups and wrapping them with a portion of film using relative means. The apparatus comprises, in combination, a film feed unit which also defines a portion of film whose length depends on the dimensions of the group of products to be wrapped, located below and close to a slot separating the first and second surfaces, and means for wrapping the group of products, consisting of at least one crosspiece which supports and guides the film, supported at one end by a single, motor-powered bar, positioned close to one side of the second surface. There are also adjusting means, acting at least upon the single bar and designed to allow a rotation of the crosspiece between a first, active trajectory, extending over the second surface, and a second, return trajectory, extending under the second surface, with an arced path whose distance from the second surface varies and may be preset according to the dimensions of the group of products to be wrapped.

[0014] The technical features of the present invention, in accordance with the above-mentioned aims, are set out in the claims herein and the advantages more clearly illustrated in the detailed description which follows, with reference to the accompanying drawings, which illustrate a preferred embodiment of the invention without limiting the scope of the inventive concept, and in which

- Figure 1 is a front view with some parts cut away to better illustrate others and in a first operating position, of a machine for wrapping groups of products with plastic film equipped with the apparatus according to the present invention;
- Figure 2 is a front view with some parts cut away to better illustrate others, of the individual apparatus illustrated in Figure 1;
- Figure 3 is a top plan view with some parts cut away to better illustrate others, of the apparatus illustrated in Figure 2;
- Figure 4 is a schematic front view with some parts cut away to better illustrate others, of the apparatus illustrated in the previous figures, in a first series of operating movements by a bar for wrapping a first groups of products;
- Figure 5 is a schematic front view with some parts cut away to better illustrate others, of the apparatus illustrated in the previous figures, in a second series of operating movements by a bar for wrapping a second group of products;
- Figures 6 and 7 are respectively a front view and a top plan view of an alternative embodiment of a detail of the apparatus according to the present invention.

[0015] With reference to the accompanying drawings, and in particular with reference to Figures 1, 2 and 3, the apparatus disclosed is used for wrapping groups 1 of products with film 2, in particular, but without limiting the scope of application of the invention, heat-shrink plastic film.

[0016] The apparatus, labelled 3 as a whole, comprises, in the parts of particular interest in this description: a first conveyor surface 4, with a direction of feed indicated by arrow A, for products 5 which may be, for example, anything from bottles (size with the largest height dimension) to cans or Tetrapak foodstuff containers (for the minimum height dimension which can be wrapped).

[0017] These products 5 are transferred to a second surface 6 which forms groups 1, using known means which are not illustrated, and wraps the groups 1 according to the preset sizes, using means 7, with a portion of the plastic film 2. When wrapping is complete, the ends of the portion of film are attached to the group 1 of products and the vertical sides of the group 1 of products are uncovered, this being the technique known to experts in the field, then the group of products is sent on to a station with an oven so that final film adhesion to the products can be achieved, thanks to the heat-shrink nature of the film, creating the finished pack.

[0018] As illustrated in Figure 1, the apparatus comprises, in combination, a film 2 feed unit 8, which also defines the portion of film whose length depends on the dimensions of the group 1 of products to be wrapped, and means 7 for wrapping the group 1 of products, consisting of at least one crosspiece 10 which supports and guides the portion of film 2 exiting a slot 9 separating the conveyor surfaces. The crosspiece 10 is supported, in such a way that it is offset, at one end by a single motor-powered bar 11.

[0019] Starting with the above-mentioned unit 8, it is below and close to the slot 9 separating the first and second surfaces 4 and 6, allowing the film 2 to be fed out and its first interception by the group 1 of products.

[0020] The unit 8 consists of two pairs of opposite rollers 8a and 8b, which grip and feed the film 2. Between the rollers there is a rotary knife 8c, opposite a surface 8d which supports the film 2 fed, designed to cut the portion of film. The unit 8 is driven by a unit which is not illustrated, which is, in turn, controlled by a control unit 26 which can be programmed in such a way as to regulate the film feed speed on the second surface 6 and cut the film to a length appropriate to the size of the products to be wrapped (procedure described in more detail below).

[0021] Again as illustrated in Figures 1 to 3, the above-mentioned bar 11 is close to one side of the second surface 6 and is controlled by adjusting means 12 designed to allow a rotation of the crosspiece 10 between: a first, active trajectory, labelled T1, extending over the second surface 6, and a second, return trajectory T2, extending below the second surface 6. Both trajectories T1 and T2 have an arced path whose distance from the second surface 6 varies and may be preset according to the dimensions of the group 1 of products to be wrapped.

[0022] In the embodiment illustrated, the single bar 11 preferably supports a pair of crosspieces 10 attached to the ends of the bar 11.

[0023] The two crosspieces 10 each have an elongated circular cross-section, and are attached to, and project from, the bar 11.

[0024] As illustrated in Figures 1 to 3, part of the adjusting means 12 are attached to the single bar 11 and adjust the bar 11 on a vertical axis Z intersecting the centre C of rotation of the bar 11.

[0025] Another part of the adjusting means 12 are connected to the single bar 11 drive unit 13 and act upon the bar 11 to allow the passage of the crosspieces 10, at the slot 9, varied according to the length of film 2 fed at the slot 9. In other words, the position of the individual crosspiece 10 relative to the length of film 2 already fed out, may be advanced or delayed depending on requirements due to the size of the group 1 of products.

[0026] At structural level, the single bar 11 is slidably attached in a guide 14 integral with a gear wheel 15, which forms the centre C of rotation of the bar 11. The gear wheel 15 is controlled by a drive unit 13 by means of a chain 16, allowing the bar 11 to turn about the second surface 6.

[0027] As regards adjustment along the axis Z, this part of the adjusting means 12 comprises a tie rod 17 pivoted, at one end, on a portion of the single bar 11 at a point offset from the centre C of rotation of the bar 11. The other end of the tie rod 17 is attached by a nut screw

17a to a worm screw 18, extending vertically, and attached to a fixed frame 19 on the apparatus.

[0028] This worm screw 18 is, in turn, controlled by control means 20 designed to allow a variation, in both directions along the vertical axis Z, in the position of the end of the tie rod 17 relative to the second surface 6, to define the wrapping and return trajectories T1 and T2 of the crosspieces 10 according to a preset amplitude which depends on the size of the group 1 of products (described in detail below).

[0029] The tie rod 17 pivots on a support block 21 attached to the bar 11 and fitted with means 22 which lock the block 21 to or release it from the single bar 11, allowing the tie rod 17 to be positioned, by sliding the block 21 on the bar 11, relative to the bar 11 with the above-mentioned vertical adjustment of the other end of the tie rod 17. In practice, to allow the tie rod 17 to be adjusted in height, the latter must be released from the bar 11 so that the tie rod does not move the bar relative to the second surface 6.

[0030] As illustrated in Figures 6 and 7, the tie rod 17 locking/release means 22 comprise a handle 27 which locks the block 21 by friction and releases it relative to the bar 11.

[0031] A second, threaded tie rod 28 is also attached to the block 21, in a special seat 21a, attached at the end of the bar 11 and allowing the tie rod 17 to be retained by traction and its final adjustment after the above-mentioned adjustment in height of the other end of the tie rod 17.

[0032] Again as illustrated in Figures 1 and 3, the other part of the adjusting means 12 comprise the gear wheel 15 consisting of a hollow ring 23 in which an idle circular element 24 engages, to which the above-mentioned guide 14 is attached, and supported by the fixed frame 19.

[0033] The numeral 25 indicates locking and release means acting between the gear wheel 15 and the circular element 24 in such a way as to allow adjustment of the bar 11 attached in the guide 14 according to a crosspiece 10 starting angle which may be preset relative to the horizontal line defined by the second surface 6.

[0034] The above-mentioned bar 11 drive unit 13 is programmed, partly according to the size, to allow a constant bar 11 speed of rotation, whilst the unit 8 speed, that is to say, the film 2 unwinding speed depends both on the bar 11 speed of rotation and the bar 11 operating trajectory T1.

[0035] In practice, the apparatus structured in this way operates as follows, beginning at the start of a cycle for a new group of products.

[0036] The operator uses the means 12 to adjust the apparatus according to the dimensions of the group of products to be wrapped. That is to say, if tall groups of bottles are to be wrapped (as illustrated in Figures 1 to 4), the operator adjusts the position of the end of the tie rod 17 pivoted on the worm screw 18 so that the tie rod is over the surface 6 (see arrow F1) with a consequent adjustment of the end of the tie rod 17 attached to the bar 11.

[0037] In addition, adjusting means 25 for the crosspiece 10 starting position relative to the slot 9 can be used and the unit 8 adjusting means 26 can be programmed to automatically vary the film 2 unwinding speed by means of preset programs with algorithmic calculations according to the bar 11 speed of rotation, and according to the trajectories and positions of the bar 11 during its rotation depending on the dimensions of the group of products. In this case, film 2 unwinding must be considerable and rapid, since the products to be wrapped are large.

[0038] Bar 11 rotation and, therefore, the rotation of the crosspieces 10, is guided by the tie rod 17, that is to say, for each angular sector covered by the bar 11 over the second surface 6, the resulting trajectory T1 is defined by the line connecting the two sides formed by the bar 11 and the tie rod 17, which tends to lift the bar 11 (during trajectory T1) given its fixed pivoting point above the second surface 6 and relative to the bar 11 centre C of rotation. This crosspiece 10 position lifting is allowed thanks to the fact that the bar 11 slides inside the guide 14 so that the film 2 wrapping trajectory T1 is higher and the trajectory T2 is lower than the second surface 6.

[0039] The position of the two crosspieces 10 becomes equidistant from the centre C of rotation again when the crosspieces 10 must, individually, cross the slot 9 or the spaces separating the second surface 6 from the other stations.

[0040] Figure 5 illustrates a situation which is the opposite of that in Figure 4, that is to say, where the products to be wrapped are low.

[0041] In this case, the pivoting point of the tie rod 17 must be lowered so that it is below the second surface 6 and the bar 11 centre C of rotation (see arrow F2). In this way the film 2 wrapping operating trajectory T1 resulting from this geometric configuration is closer to the second surface 6, whilst the crosspiece 10 return trajectory T2 is distanced from the second surface 6, again by the action of the tie rod 17. This configuration, therefore, allows the film 2 used to wrap the group of products fed along the second surface 6 to be brought much closer to them.

[0042] Similarly, the unit 26 programmes the unit 8 with an unwinding and cutting speed appropriate for the type of product to be wrapped, which means a slower bar 11 speed and less film unwound than previously described.

[0043] A further improvement in the apparatus could be to equip the bar 11 with a drive unit with variable timing (such as a brushless motor), illustrated as a block 50 with a dashed line in Figure 1, to allow a variation in the bar 11 speed of rotation in given operating situations, controlled by the unit 26 with the possibility of increasing both overall apparatus productivity and the types of products which can be wrapped.

[0044] The apparatus disclosed, therefore, fulfils the preset aims, thanks to a combination of elements which form an extremely simple structure which can, with just a few simple operations, be rapidly and safely adjusted for size changeovers.

[0045] The positioning of the wrapping unit on only one side of the machine and the position of the unwinding and cutting unit allow a single adjustment of the operating elements for the size to be wrapped, maintaining the quality and precision required during the wrapping step.

[0046] Therefore, size changeover times are drastically reduced and allow the machine, fitted with the apparatus, to have highly flexible productivity with many types of products in a variety of sizes.

[0047] The invention described can be subject to modifications and variations without thereby departing from the scope of the inventive concept. Moreover, all the details of the invention may be substituted by technically equivalent elements.

Claims

1. An apparatus for wrapping groups (1) of products with film (2), the apparatus (3) comprising at least: a first conveyor surface (4) with a direction of feed (A) for the products (5) to a second surface (6) for forming the groups (1) and wrapping the groups (1), using means (7), with a portion of film (2), the apparatus being **characterised in that** it comprises, in combination:

   - a film (2) feed unit (8) which also defines the portion of film (2) whose length depends on the dimensions of the group (1) of products to be wrapped, located below and close to a slot (9) separating the first (4) and second (6) surfaces; and
   - means (7) for wrapping the group (1) of products consisting of at least one crosspiece (10) which supports and guides the portion of film (2) supported at one end by a single motor-powered bar (11), positioned close to one side of the second surface (6); adjusting means (12) acting at least on the single bar (11) and designed to allow rotation of the crosspiece (10) between a first, active trajectory (T1) extending over the second surface (6), and a second, return trajectory (T2) extending under the second surface (6), with an arced path whose distance from the second surface (6) varies and may be preset according to the dimensions of the group (1) of products to be wrapped.

2. The apparatus according to claim 1, **characterised in that** the film (2) feed and cutting unit (8) is controlled by means (26) for adjusting film (2) unwinding and cutting according to the group (1) of products (5) to be wrapped, the bar (11) speed of rotation and the first operating trajectory (T1).

3. The apparatus according to claim 1, **characterised in that** the crosspiece (10) is supported by, and projects from, the single bar (11).

4. The apparatus according claim 1, **characterised in that** the single bar (11) supports at least a pair of crosspieces (10) attached to, and projecting from, the ends of the bar (11).

5. The apparatus according claim 1, **characterised in that** part of the adjusting means (12) are attached to the single bar (11) and adjust the bar (11) on a vertical axis (Z) intersecting the bar (11) centre (C) of rotation.

6. The apparatus according to claim 1, **characterised in that** part of the adjusting means (12) are connected to the bar (11) drive unit (13), acting upon the bar (11) in such a way as to allow the passage of the crosspiece (10), at the slot (9), which varies according to the length of the film (2) fed at the slot (9), that is to say, in a crosspiece (10) position which is advanced or delayed relative to a preset film (2) length.

7. The apparatus according to claims 1 and 5, **characterised in that** the single bar (11) is slidably attached in a guide (14) integral with a gear wheel (15), forming the centre (C) of rotation of the bar (11), the gear wheel (15) being controlled by a drive unit (13) by means of a chain (16), allowing the bar (11) to turn about the second surface (6).

8. The apparatus according to claims 1 and 5, **characterised in that** part of the adjusting means (12) comprise a tie rod (17) pivoted, at one end, on a portion of the single bar (11) at a point offset from the centre (C) of rotation of the bar (11), the other end of the tie rod being attached to a worm screw (18), extending vertically, and attached to a fixed frame (19) on the apparatus; the worm screw (18) is, in turn, controlled by control means (20) designed to allow a variation, in both directions along the vertical axis (Z), in the portion of the end of the tie rod (17) relative to the second surface (6), defining the wrapping and return trajectories (T1, T2) of the crosspiece (10) according to a preset amplitude which depends on the size of the group (1) of products.

9. The apparatus according to claim 8, **characterised in that** the tie rod (17) pivots on a support block (21) attached to the bar (11) and fitted with means (22) for locking the block (21) to or releasing it from the

single bar (11), allowing the tie rod (17) to be positioned, by sliding on the bar (11), relative to the bar (11) when the other end of the tie rod (17) is vertically adjusted.

10. The apparatus according to claims 6 and 7, **characterised in that** part of the adjusting means (12) comprise at least the gear wheel (15) consisting of a hollow ring (23) in which an idle circular element (24) engages, to which the guide (14) is attached, and supported by a fixed frame (19); there being locking and release means (25) acting between the gear wheel (15) and the circular element (24) in such a way as to allow adjustment of the single bar (11) attached in the guide (14) according to a crosspiece (10) starting angle which may be preset relative to the horizontal line defined by the second surface (6).

11. The apparatus according to claim 1, **characterised in that** the bar (11) drive unit (13) is controlled by a machine control unit (26) acting upon the unit (8) which feeds and defines the film (2) portion, synchronising and varying the film (2) feed and cutting speed according to the size of the products to be wrapped and the bar (11) speed of rotation.

12. The apparatus according to claim 1, **characterised in that** the crosspiece (10) has an elongated circular cross-section and is attached to, and projects from, the single bar (11).

13. The apparatus according to claim 9, **characterised in that** the tie rod (17) locking/release means (22) comprise a handle (27) which locks the block (21) by friction and releases it relative to the bar (11); there being a second, threaded tie rod (28) attached to the block (21), attached at the end of the bar (11) and allowing the tie rod (17) to be retained by traction and its final adjustment after the adjustment in height of the other end of the tie rod (17).

14. The apparatus according to claims 1 and 2, **characterised in that** the film (2) feed and cutting unit (8) comprises two pairs of opposite film (2) feed rollers (8a, 8b), there being a rotary knife (8c) between the two rollers, designed to cut the portion of film (2) supported by a surface (8d).

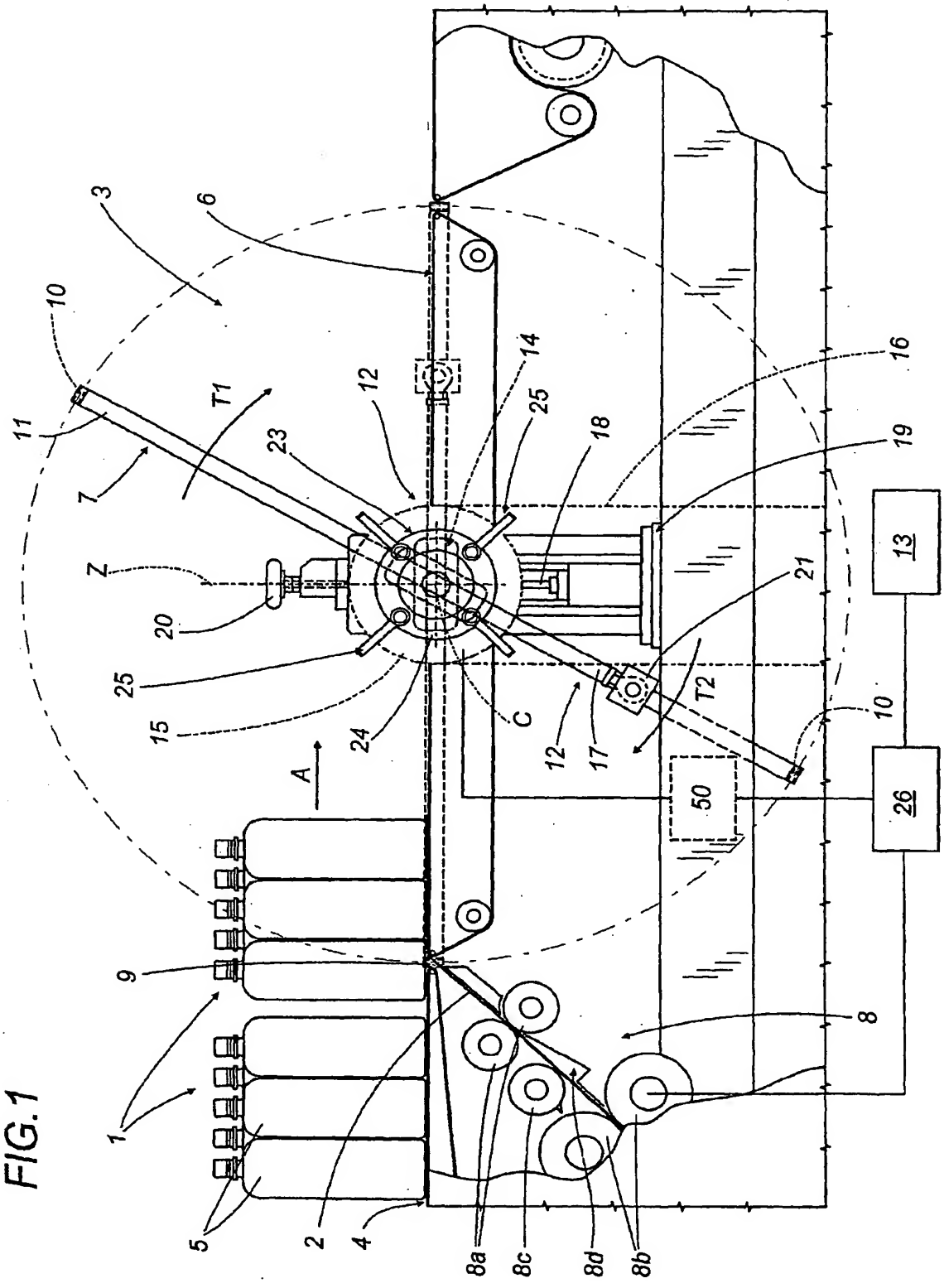


FIG.1

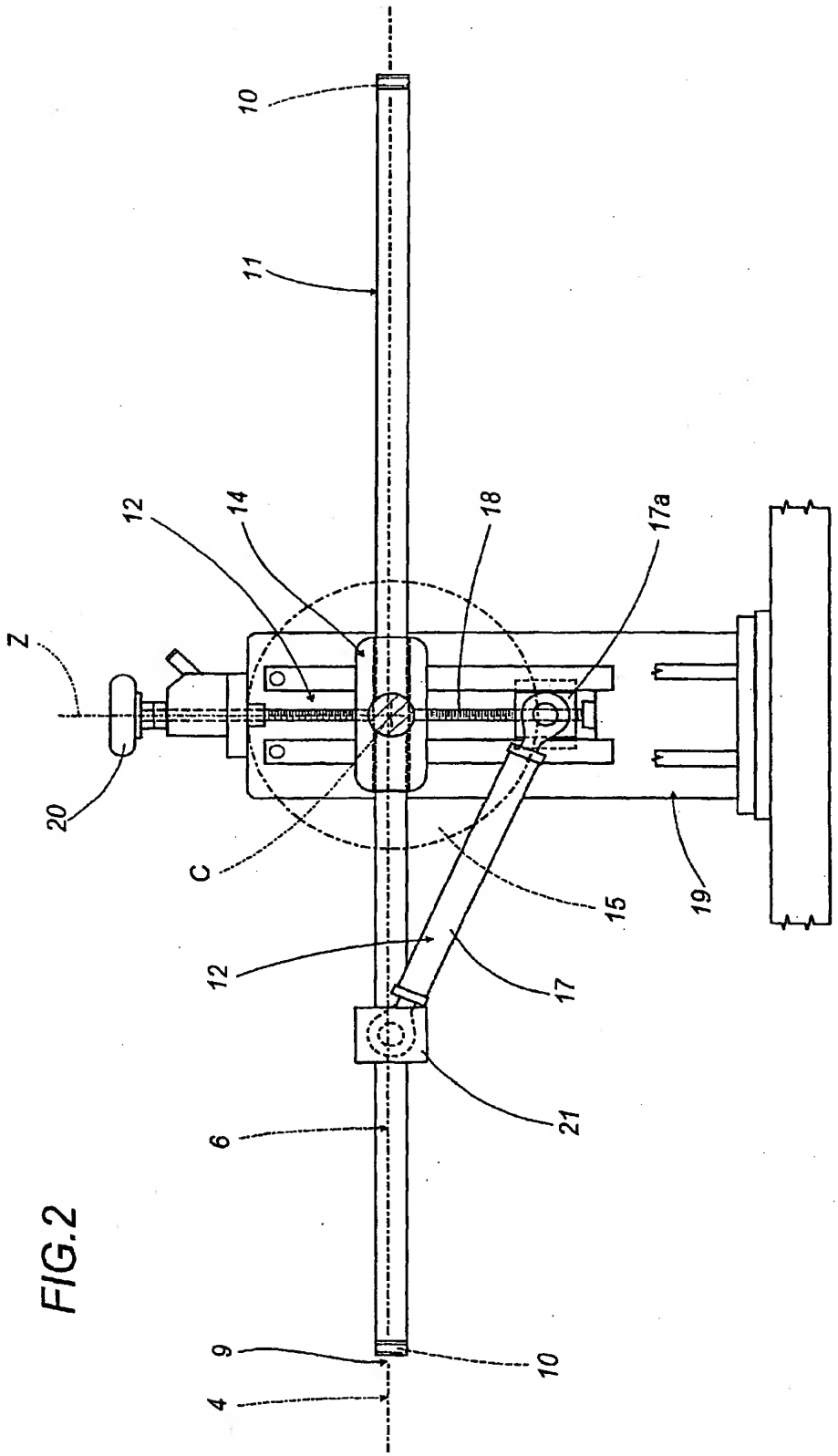


FIG.2

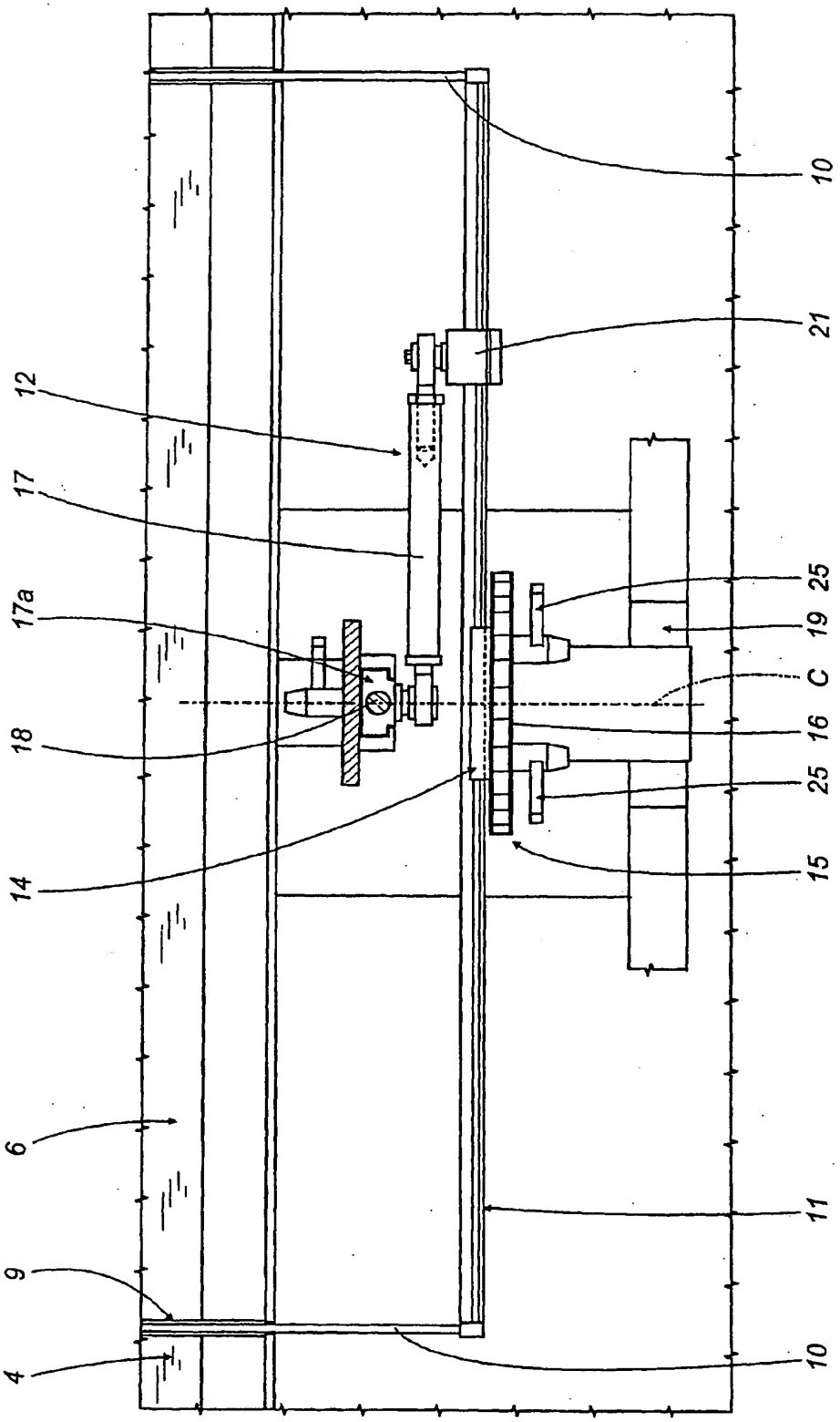


FIG.3

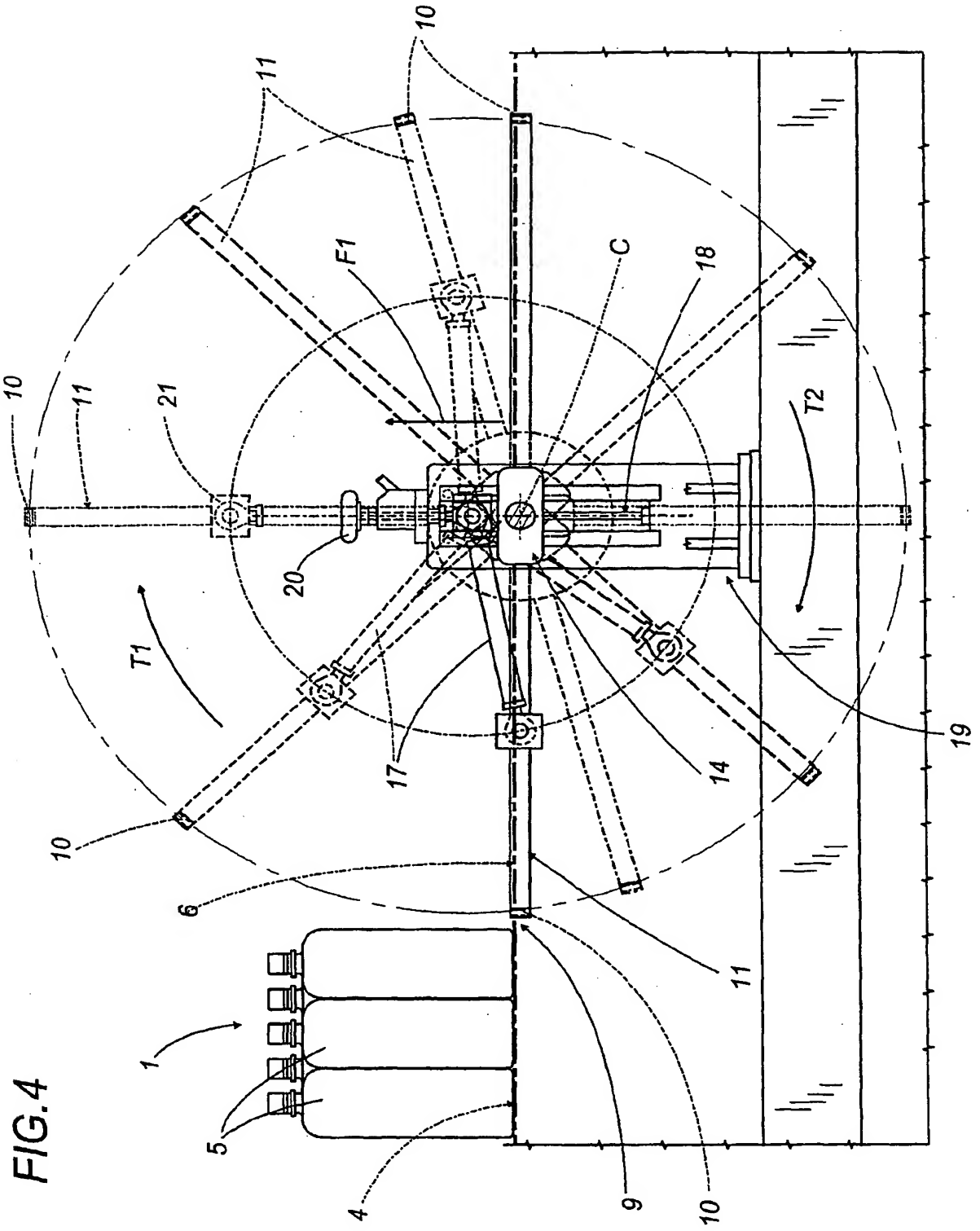


FIG.4

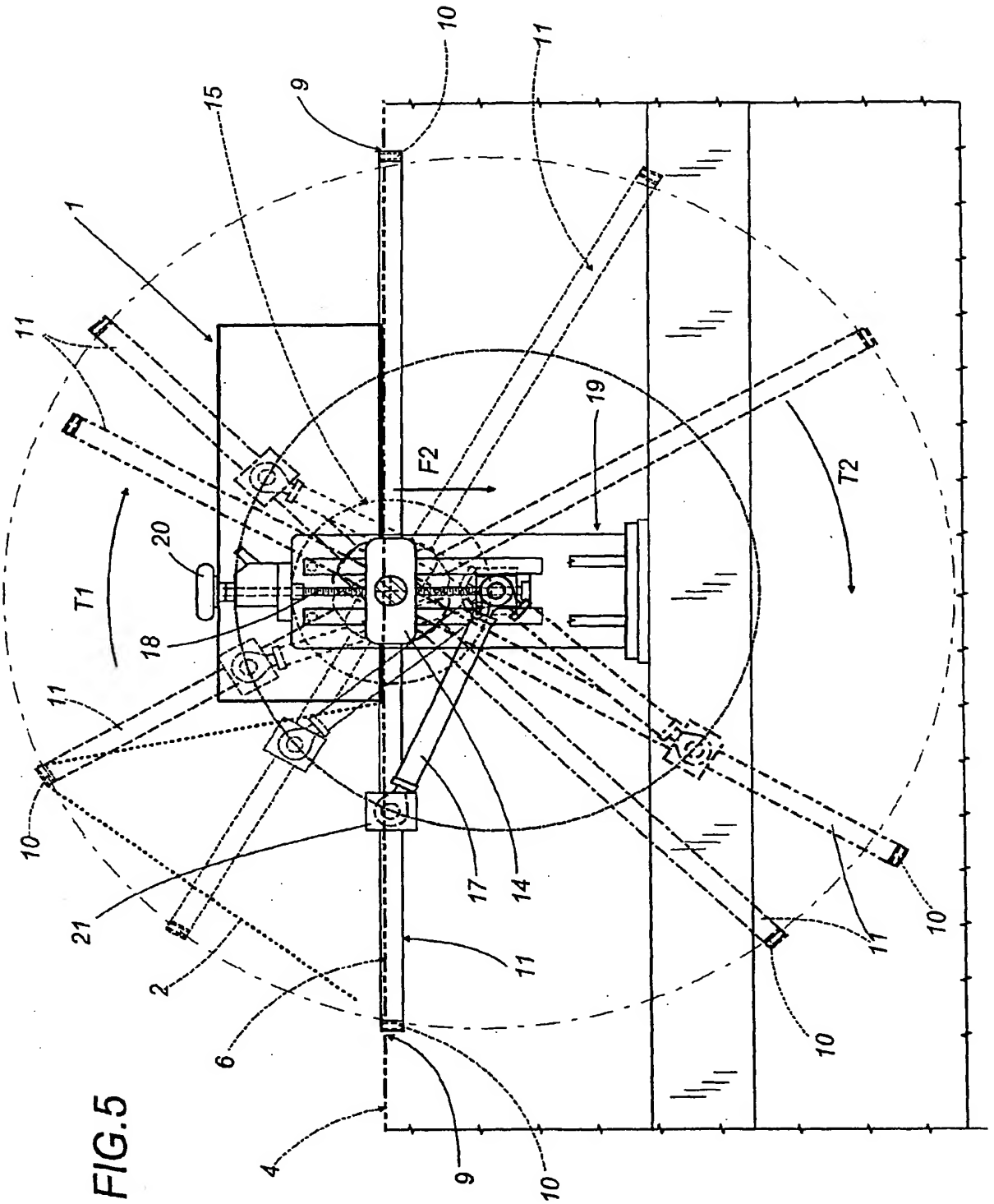


FIG.5

FIG.6

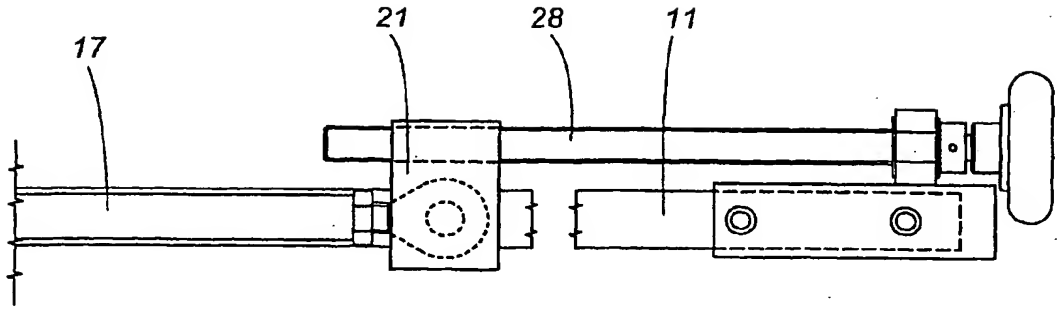
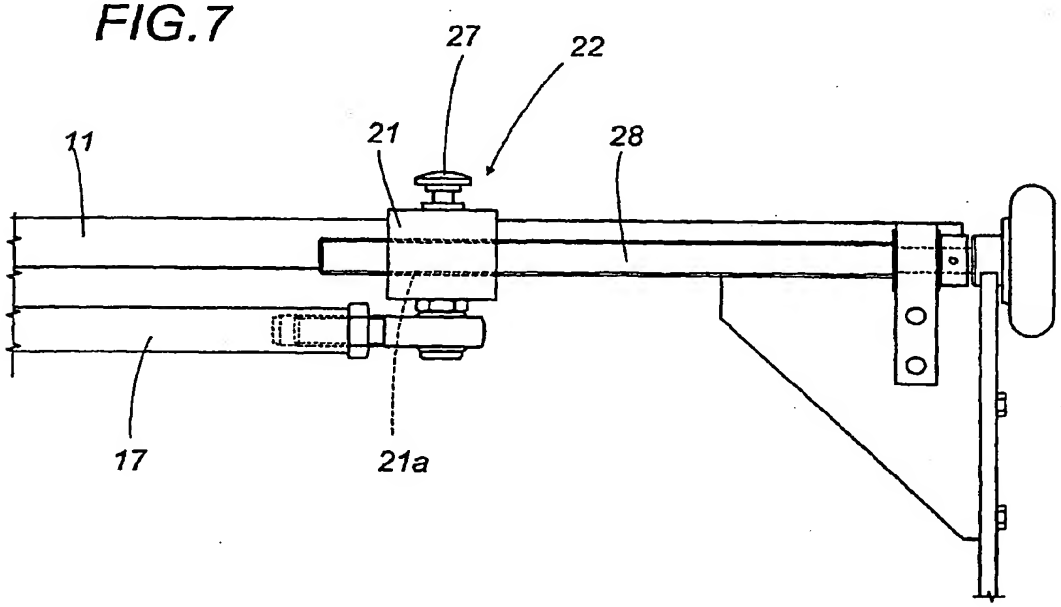


FIG.7



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EUROPEAN SEARCH REPORT

Application Number
EP 02 42 5287

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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TECHNICAL FIELDS SEARCHED (Int.Cl.7)
B65B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	23 August 2002	Jagusiak, A

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